A STUDY ON THE KEY SUCCESS FACTORS OF UNIVERSITY UTARA MALAYSIA'S PORTAL SERVICE PERFORMANCE

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Abstrak

Portal UUM adalah sebuah platform yang boleh diakses yang direka untuk pelajar mengakses maklumat mengenai universiti di mana ia bertindak sebagai pusat pembelajaran pelajar dengan pelbagai perkhidmatan yang berkaitan. Baru-baru ini, teknologi berkembang dari masa ke semasa pada kadar, ulasan dan kemas kini dengan ciri-ciri yang berjaya untuk memastikan prestasi perkhidmatan portal pada tahap yang lebih tinggi untuk mendapatkan keperluan pengguna dan kepuasan. Oleh itu, objektif kajian ini adalah untuk mengenal pasti hubungan antara kegunaan yang dirasakan, kemudahan penggunaan dan sikap pelajar terhadap penggunaan portal UUM dengan prestasi perkhidmatan portal UUM. Sejumlah 98 orang responden yang terdiri daripada pelajar-pelajar dari College of Business (COB) telah mengambil bahagian dalam kajian ini. Data dianalisis melalui analisis deskriptif, Pengelasan Persamaan Struktur Separa Minimum (PLS), penilaian model pengukuran dan penilaian model struktur. Dapatan kajian menunjukkan terdapat hubungan positif yang signifikan antara kegunaan yang dirasakan, kemudahan penggunaan, dan sikap terhadap penggunaan dengan prestasi perkhidmatan portal. Kajian ini disimpulkan dengan beberapa cadangan dengan menghubungkan kepada factor-faktor kejayaan sesebuah portal untuk meningkatkan lagi sistem portal UUM pada masa akan datang.

Kata kunci: Perkhidmatan Prestasi Portal, Faktor Kejayaan Portal, dan Pengelasan Persamaan Struktur Separa Minimum (PLS).

Abstract

The UUM Portal is an accessible platform that definitely designed for UUM students to access the information about the university and acts as the student's learning center with various related services. Recently, the technology evolves over time at the rate, reviews and updates with the successful features to ensure the portal service performance at the higher level to gain the user requirements and satisfactions. Thus, the objective of this study is to identify the relationship between student's perceived usefulness, ease of use and attitude towards using the UUM portal service performance. A total of 98 respondents amongst the students of College of Business (COB) were participated in this study. The data were analyzed via descriptive analysis, Partial Least Squares Structural Equation Modelling (PLS), measurement model assessment and structural model assessment. Finding contributed that there were positive significant relationship between the perceived usefulness, perceived ease of use, and attitude towards using, with portal service performance. The study concluded with some suggestions with embedded the keys success factors to further enhance the UUM portal system in future.

Keywords: Portal Performance Services, Portal Key Success Factor, and Partial Least Squares Structural Equation Modelling (PLS).

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List of Abbreviations

ATU	Attitude Towards Use
AVE	Average Variance Extracted
BI	Behavioral Intention
CAS	College of Arts and Sciences
COB	College of Business
COLGIS	College of Law, Government and International Studies
CR	Composite Reliability
DV	Dependant Variable
HTMT	Heterotrait-Monotrait Ratio of Correlations
IT	Information Technology
IV	Independent Variable
LAN	Local Area Network
MIS	Management Information System
PEOU	Perceived Ease of Use
PFA	Public Finance Act
PLS-SEM	Partial Least Squares Structural Equation Modelling
PU	Perceived Usefulness
SSO	Single Sign-On
TAM	Technology Acceptance Model
TRA	Theory of Reasoned Action
UUM	University Utara Malaysia
UUMIT	University Utara Malaysia Information Technology
VIF	Variance Inflation Factor

CHAPTER ONE
INTRODUCTION

1.1 Overview

Chapter One presents the overall study and briefly explains the aims of the research. Several sections have been defined to classify and identify the purpose of this study. These include research background, research problem statement, research objectives, research scope, significant of the study, and thesis outline.

1.2 Background

The University Utara Malaysia (UUM) was established on 16 February 1984. The university was corporatized on 23 April 1998. The main campus is on 1,061-hectare site in Sintok, Kedah. The UUM is 48 km north of Alor Setar, 10 km south of the Bukit Kayu Hitam and are near Malaysia - Thailand border. Others towns near UUM are Jitra and Changlun. In January 2008, a restructuring of the university academic system was undertaken. Thirteen faculties were merged and streamed into three main academic colleges: UUM COB (UUM College of Business), UUM CAS (UUM College of Arts and Sciences), and UUM COLGIS (UUM College of Law, Government and International Studies). Thus, UUM also has fifty-five (55) Department, Centers, and Units.

Under the UUM, the UUMIT has been established at 1 Mac 1988 and earlier known as Computer Centre. The aim of UUMIT is to build the UUM based on computerized-Oriented in every activity in university. UUMIT provides a comprehensive of computers and networking to support the learning application in

the University. It was also as the main bone of University in managing, monitoring, maintaining, data keeping for each information system management in University based on computerization.

The vision of UUMIT is to support University to become the best-connected campus in which, to create a digital campus where everyone is virtually connected and communication is seamless, allowing learning across physical boundaries, anywhere, anytime, any device. UUMIT has built the UUM portal as the main website to the University. The UUM portal is an intranet portal dedicated for UUM staff, faculty, students and also guests. This is a one-stop portal to facilitate our community to access information for teaching, learning, academic, and administration. UUM portal uses a Single Sign-On technology, which means only one username and password are needed to gain access to various applications such as UUM email, UUM online learning and etc. This portal also allows users to do "Self Service Password Reset".

The portal services in the university level are important to the staffs and students who are using the university's portal in managing their routine life in university. The portal acts as "one platform to get information, where the visitor ease to find the information. Thus, the portal services act as global access to their information, where a person can be anywhere in the world can get the information as they need. Therefore, this study is significant to improve the portal service performance with the key successful factors in providing good performance with accurate feedback to satisfy the user satisfaction.

1.3 Research Problem

The use of an online student portal is now becoming an essential part of the students in the higher education institute. On top of that, it is crucial that continuous evaluation of the learner's satisfaction should be done to determine if the provided portal is learner support system, in which the successful of portal in providing the learning experiences especially for the student and also the community in the university (Mohammaed, 2018 ; Grunert, 1999). The portal should be improved in a timely basis as to be implemented systematically for guaranteed the satisfaction and success among all students (Oliha, 2018). Additionally, the portal must be learner-centered and user-friendly (Floyd and Powell, 2004). The regardless to provide the successful portal in promoting the gratitude, ease of operations, the productivity gains and cost savings, will influence the level achievement of service performance of portal (Tu, Lee & Wei, 2018). These factors will cause the un-successful of portal to provide the perceived usefulness, ease of use, attitude towards using and achieved the positive benefits and satisfaction amongst the university community (Bazza & Khalieq, 2016).

Recently, the UUM's portal has received several complaints according to their services performance, where the web portal services was always keep changing in timely basis. This problem is due to the UUM's portal service performance has lacked to standardize the web services. For example, the use of standards for defining how information get into channels, can help in the standardization of web-based services on a campus. The UUM's portal would not have to re-invent the user interface each time. Instead, they can concentrate on the back-end database integration, and utilize the existing portal for the user interface.

However, the university community should receive benefit from the portal in efficiency and effectiveness to carry out their role in the institution (Kim, Kim & Jeon, 2018). Therefore, the portal services performance should be improved in timely basis to increase the speed and customizing the content of information provided to the users.

1.4 Research Objectives

The aim of this research is to study the key success factors of UUM portal. In order to achieve the aim of this research, several specific objectives have been defined such as:

i) The relationship between student's perceived usefulness towards using UUM portal service performance

ii) The relationship between student's ease of use towards using UUM portal service performance

iii) The relationship between student's attitude towards using UUM portal service performance

1.5 Research Questions

I. What is the current status of usage of level of UUM portal service?

II. Is there a positive relationship student's perceived usefulness towards using UUM portal service performance?

III. Is there a positive relationship between student's ease of use towards using UUM portal service performance?

IV. Is there a positive relationship between student's attitude towards using UUM portal service performance?

1.6 Research Scope

The main scope of this research is to focus on the student of Universiti Utara Malaysia (UUM). Generally, the university's portal is built for the student as a platform to the student connectivity to the university's activities through the online. University's portal is also known as a student portal in which the concept of the online gateway where students can access any activities provided by University to all students. For instance, the students are allowed to an online registration system, view their grades, request for any documents required for their studies, updates the student's profile, financial statements, online learning (e-learning), view the class schedule and etc.

UUM has almost 20,000 students consists of local and international students. There are three (3) school of studies which are UUM College of Business (UUM COB), UUM College of Arts and Sciences (UUM CAS), and UUM College of Arts and Sciences (UUM CAS). UUM COB has sixteen (16) program offered for undergraduate and postgraduate, while UUM CAS has fifteen (15) program offered and UUM COLGIS has eight (8) program offered to the student. All students have created an account by University Utara Malaysia Information Technology (UUMIT) once they are registered in UUM. Therefore, a total of 2,400 students from College of Business (COB) have been participated in this study as the main scope of the research.

1.7 Significant of study

This research is beneficially in upgrading the UUM portal by highlighting several criteria to enhance the reliability and flexibility of the University's portal. The significant of the study provides more advantages and benefits to the UUM's

students in supporting their satisfaction towards using the portal. Furthermore, this research is also useful to the faculty and staff of UUM itself in providing the high quality of the university's portal and achieve the goal and objectives of the university's aimed. This significance is described below:

Benefit to the students

The university's portal is the benefit to the student as the main scope in this study. The university's portal provides web interface to courseware and required information about courses, increased and easier communications with faculty online access to grades, financial aid information, class schedules, graduation checks, access to the communities of interest within the university, sports, clubs, and community services opportunities, and increased life-long learning opportunities.

Benefit to the Faculty and Staff

Generally, a university portal can bring audience, application, systems, and processes together to form a centralized collaboration experience. Portal software integrates technologies to build personalized work areas and communities to increase productivity for users. Portal software is built for corporate intranets, extranets, communities, web sites, and projects involved in the university. Depending on the kind of business needs and the portal software, one can expect to gain several benefits from using portal software in any environment. This study provides the significant to the faculty and university's staff to efficiently deliver information to the audience, increase productivity for the end user, provides customizable features and development tools, increase interaction between the staff and student, personalized environments for end users and integration of external applications and services by portlets. Thus, the faculty and staff can build easy management style in

real time communication with students, simplified course management tools, instant access to information for advising students; and easily accessible information for every facet of their job.

1.8 Thesis Outline

This research consists of seven chapters and the remaining chapters are organized as follows:

Chapter One: Introduction

The chapter includes the preliminary study that has been conducted including research background, research problem, research question, research objectives, research scope and the significance of the study.

Chapter Two: Literature Review

This chapter gives an overview of the current university portal criteria as the success keys factors in developing portal. It is including the literature including the strength and weaknesses of the university's portal. The focus gives on the criteria that need to be highlighted for developing university portal in the previous studies. It also presents an overview of the efforts made to address the problem occurred in the existing university portal and strongly focused on UUM. Several ideas are discussed and reviewed to improve and enhance the UUM portal via the proposed criteria as the key factors of UUM portal.

Chapter Three: Research Methodology

This chapter gives an explanation of the sequential phases in the research methodology that was used to achieve the research objectives. The discussions are

furthered in details of three (3) phases of research methodologies such as theoretical study, exploratory study and provides several criteria as the key success factors of UUM portal.

Chapter Four: Findings

This chapter presents the finding of the exploratory study using the survey technique that was conducted in UUM and the respondents involved are students. The findings were presented in perceived usefulness, perceived ease of use, the attitudes towards using, and portal service performance. The results of this finding contributed to define the criteria that are significantly need to be highlighted in improving and enhancing the UUM portal. Thus, the highlighted criteria were also known as the key success factors of UUM portal.

Chapter Five: Discussion and Conclusion

This chapter has discussed the finding of this study. It was presented the finding contributed by three hypothesizes that related to perceived usefulness, perceived ease of use, and attitudes towards using towards portal service performance. The mean, frequency, and standards deviation are presented to show the results towards using the UUM portal by UUM students. The findings are also shown the real action, perception, and satisfaction of UUM students towards using the UUM portal amongst the UUM's students. The conclusion of the research was presented simultaneously with the review of the studies that have been conducted to achieve the research objectives in this study. Further discussions are highlighted on the contributions of this research, and finally a significant of issues were addressed as future research at the end of this chapter.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter reviews on previous works related to this study. The purpose of this chapter is to discuss the preliminary study that has been carried out on the UUM portal. Thus, it focuses on all interactive service that is delivered on the internet using advanced information. In the process of applying the UUM portal, the university has to be alerted on student requirements and needs. Awareness of UUM portal is one of the characteristics for adoption and student acceptance on particular UUM portal. The student will go through a series of process and knowledge, conviction, decision and confirmation before they are ready to use the UUM portal. Students as the customers would reject to use a very complex and not user-friendly. The ease of use of innovative UUM portal is important for adoption from student perspectives. However, the customers are concerned with UUM portal capability in offering useful information, amount of information that can be provided the information format, languages and layout features. Therefore, the service performance of the portal is significantly important to ensure the user benefits and gain a high level of satisfaction towards using the portal. Also, another factor such as perceived usefulness, perceived ease of use, and attitudes towards using are extremely important to be highlighted to improve the UUM's portal services performance. Next sections discussed the factors was highlighted in this study.

2.2 Service Performance Portal

Performance is a complex concept due to it has different meanings for different influences, determined by the organization and context (Carter, 1991). Halachmi

(2005) defines performance as the public service indicates the efficiency and effectiveness, in which a political issue on the agenda of most countries. While, service performance is a type of measurement for the services for ensuring satisfying the social needs of the users (Coste & Tudor, 2013). The measurement of service performance is extremely important to measure the level of services that has been performed in any facility is satisfied the user needs. Therefore, the measurement of service performance are to poorly define but often discussed (Eccles, 1991; Schneiderman, 1999; Neely, 2005; and Aubert & Bordeau, 2012). Bourne and Wilcox (1998) suggested that each performance indicator should have a definition to avoid creating misunderstandings between different people. Figure 2.1 illustrates the term involved in defining service performance.

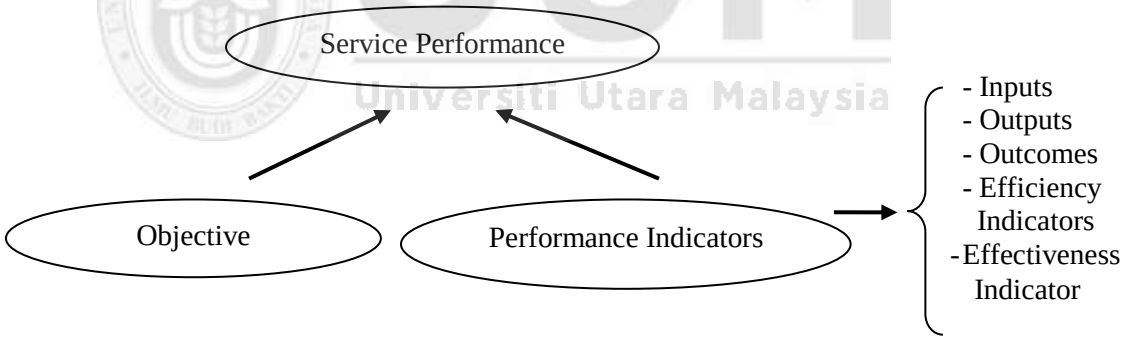

Figure 2.1. The term that define service performance

Based on the Figure 2.1, the indicators of inputs, outputs, outcomes, efficiency indicators, and effectiveness indicators have the relationship to each other for defining service performance. The *Objectives* are results that a company wants to achieve (IPSASB, 2011). The *Objectives* are required to be specified, measurable, available to an acceptable cost, relevant and time-bound.

Public Finance Act (PFA) (1989) defined *inputs* as the resources for example the salaries and equipment which are used to produce goods and services. Besides, *inputs* can be defined as the resources of a reporting entity used to produce outputs in delivering its objectives (IPSASB, 2011). While, *Outputs* refers to resource allocation and rewards linked to measure performance (Hood, 1991). According IPSASB (2011), *outputs* are the goods and services, including transfers to others, provided by a reporting entity in delivering its *objectives*. Furthermore, the *Outcomes* are the effects of outputs on communities and society for delivering the report entity objectives (Gregory and Lonti, 2008; IPSASB, 2011).

In order to describe the relationship between inputs and outputs, the *Efficiency indicators* are measures by imposing quality services with the minimum resources necessary to provide service (IPSASB, 2011; Athanassopoulos, 2003). *Efficiency indicator* is a part of service performance in the public sector which aims to improve the working practices by focusing on "where" and "how" to manage and organize the organization that relate to the users (Gray and Hood, 2007). Finally, the *Effectiveness indicators* are measures the relationship between *outputs* and *outcomes* (IPSASB, 2011). According to Neely *et al* (1995) defines services performance as a set of matrix used to quantify the efficiency and effectiveness of the actions. Therefore, the indicators of service performance is suitable to be highlighted in improving the UUM's portal service performance.

2.3 Perceived usefulness

Perceived Usefulness (PU) is the level to which the performance of the human usage is utilised by using a certain technology (Rauniar et al., 2014). It means, the PU is used to explain in the context of an organisation, is the betterment in the output

which may lead to monetary and non-monetary benefits. Davis (1989) defined PU as the degree to which a person believes that using a particular system would enhance the human's job performance. On top of that, Phillips et al. (1994) described the PU as exemplify the users' subjective possibility that applying the new technology. This beneficially to the both for personal and organization's well-being.

Furthermore, the PU is clearly indicates or pinpoints those variables which affect the actual use and intention to continue using technology (Awa et al., 2014). According to TAM, PU is believed as a key determinant of technology followed by PEOU (Igbaria and Iivari, 1995). The PU is combined with Perceived Ease of Use (PEOU) to get more influences based on the attitude of an individual towards the intention to utilise a technology (Rauniar et al., 2014). In the other words, the PU is the capability of being used in advantageously. This beneficially to the organizational context and people who are generally reinforced for good performance by raises, promotion, bonuses and other reward (Pfeffer, 1982; Schein, 1980 & Vroom,1964). A system high in PU for which a user believes in the existence of a positive use-performance relationship.

The PU has capability to support the portal service performance, where it provides the degree to which user believe using the website portal as a platform to improve their performance or productivity. Therefore, this factor can enhance the outcome of using UUM portal as their routine life. Besides, the PU factor is competency to ease of accessibility to the system and provides the trustworthiness of user in sharing the confidential particulars information in the website portal.

2.4 Perceived Ease of Use

Perceived ease of use (PEOU) is defined as "*the individual's perception that using the new technology will be free of effort*" (Davis, 1989: 1993). It also refers to "*the degree to which a person believes that using a particular system would be free of effort* (Radner and Rothschild, 1975). This follows from the definition of "ease": "freedom from difficulty or great effort." Effort is a finite resource that a person may allocate to the various activities for which he or she is responsible (Radner and Rothschild, 1975). The application of this factor provides the ease to use the technology or services and encouraged users to use the system. The PEOU has the capability to support the portal's service performance where, the indirect effect on intention to use the portal is depend on the efficiency of the service performance to feedback on the user requirements and support the ease of use the technology.

2.5 Attitude Toward Using

Attitude Towards Use (ATU) of the UUM portal studies conducted show that attitude was a significant determinant of behavioral intention (Fishbein & Ajzen 1975 & Ajzen 1988). Attitudes were also empirically tested as a strong intermediary for motivational variables to predict behavioral intention of technology use (Taylor & Todd, 1995). However, in a recent review by Will (2005) found that nearly half of the studies being reviewed found attitude nonsignificant and did not include attitude in their model framework (Legris et al. 2003). The researches somewhat reveal that attitude had been excluded from more recent use of technology acceptance studies.

This factor has capability to support the portal's service performance, where it provides the individual's positive or negative feeling associated with performing a specific behavior. An individual would hold a favorable attitude towards a given

behavior if they believes that the service performance of that behavior will lead to mostly positive outcomes. On the other hand, if the individual believes that mostly negative outcomes will result from the behavior, they will hold a negative attitude towards it. Therefore, this factor is significant to enhance the portal's service performance.

2.6 The Concept of Key Success Factor

In order to support the credibility of portal service performance, the concept of key success factor of portal is investigated. The concept of key success factor is originally recommended in the field of Management Information System (MIS) (Nguyen, Meredith & Burstein, 2018 and Grunert, 1992). This concept was first introduced by Ronald Daniel of McKinsey & Company (1961) and later elaborated by Rockart (1979) and Bullen and Rockart (1981). According to Rockart (1981) defines the critical success factors as "the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department or organization. The concept was focused on the system structured for software systems according to the information needs of the managers (Nguyen, Meredith & Burstein, 2018). In order to ascertain managers' information needs and link them to the management information system, they invented of the term critical success factor was highlighted (Mahmoud, Haleema & Almamlook, 2018 and Ferguson, 1982).

Basically, the concept of critical success factor has inspired the concept of a key success factor. It is related to the issue of an optimum match between environmental conditions and business characteristics, for example, the core of business strategy (Mahmoud, Haleema & Almamlook, 2018). Based on the critical success factor,

Rockart (1981) elaborates the concept of key success factors are influenced by several factors. There are the industry, competitive strategy and industry position, environmental factors, temporal factors and managerial position (Mahmoud, Haleema & Almamlook, 2018). These factors are known as the concept of a key success factor. Table 2.1 describes the concept of key success factor adopted from Rockart (1981).

Table 2.1

Concept of Key Success Factor (Rockart, 1981)

Factors	Description
Industry	Demand characteristics, technology employed, product characteristics affected all competitors within an industry, but their influence will vary according to the characteristics and sensitivity of individual industry segments.
Competitive strategy and industry position	Determined by the history and competitive positioning in the industry.
Environmental	The macroeconomic influences that affect all competitors within an industry, and over which the competitors have little or no influence, e.g., demographics, economic and government legislative policies etc.
Temporal	The areas within a business causing a time-limited distress to the implementation of a chosen strategy, e.g., lack of managerial expertise or skilled workers.
Managerial position	The various functional managerial positions in a business have each their generic set of associated critical success factors.

The study on the concept of key success factors will guide the developer in developing the website portal with upgrading the features in the organization management. The management in the organization in developing the university's portal needs to be highlighted as the staff readiness to support the performance of the portal services. Besides, these factors also supported the main successful factor in this study such as PU, PEOU, and ATU with systematically.

2.7 The Criteria of Successful Portal in Software Engineering Perspective

Dealing with the criteria of successful portal, besides focusing on the criteria of the technology acceptance such PU, PEOU, and ATU as the main factors in this study, therefore the criteria of successful portal in the perspective of Software Engineering is also investigated. Based on the investigation via literature review, several criteria of the successful portal in Software Engineering perspective are determined (Sommerville, 2007). There are usability, user-friendly, and single sign-on. These criteria are elaborated further.

2.7.1 Usability

The term of usability is used in various ways and has been famously used in software development recently (Bringula & Basa, 2011 and Sommerville, 2007). These criteria are recently used in emphasizing the success of the portal (Green & Pearson, 2006). Pressman (2001) attempted to define usability as an attempt to quantify user-friendliness yielding measurable attributes of the users, such as the skills, both physical and/or intellectual, necessary to learn the system. Additionally, time is required to become efficient in the use of the system.

The usability criteria can increase user productivity who are efficient in utilizing the system. However, the usability criteria provide the successful of the portal in which it is strongly related to the users' attitude towards the system (Salleh et al, 2016). Therefore, usability is an important concept in portal development because it is equated to financial gain or loss (Bringula & Basa, 2011). Systems with poor usability due to poor website design result in negative financial impacts (Tarafdar &

Zhang, 2005). Thus, the usability features enable users to simply access another portal that can meet their needs (Cappel & Huang, 2007).

2.7.2 User Friendly

The user-friendly criteria provides highly interactive that related to the flexibility and reliability of the portal (Sommerville, 2007). This criteria extremely important to contribute a portal that makes it easy for practice and adapting the changes in the present until to the future (Bringula & Basa, 2011). The user-friendly is the good criteria that contribute the least of impacts by using the portal and provides user satisfaction (Garrett, 2000).

The portal with user-friendly criteria provides ease of use to the user in managing anything that relates to the user (Massing, 2017). A portal with user-friendly features offered the user-centric technology like drag and drop capabilities, click-to-dial phone numbers, the ability to upload, listen to and record greetings, pay bills, view call history, listen to voicemail and import contacts, all from one central website (Massing, 2017; Morville & Rosenfeld, 2014 and Bringula & Basa, 2011).

The user-friendly criteria in the portal are also supported by the user interface design (Sommerville, 2007). Besides, understanding the goals of portal, skills, preferences, and tendencies, there are considered several criteria to ensure the user-friendly of the portal (Garrett, 2000). For example, keep the interface simple in which the interface design is easy to be used by the user in a click (Massing, 2017).

They avoid unnecessary elements and are clear in the language they use on labels and in messaging (Morville & Rosenfeld, 2014). Thus, the needs to create consistency and use common UI elements (Bringula & Basa, 2011). This feature

provides users to feel more comfortable and is able to get things done more quickly (Morville & Rosenfeld, 2014). It is also important to create patterns in language, layout, and design throughout the site to help facilitate efficiency (Bringula & Basa, 2011 and Grunert & Ellegaard, 1992).

Another criteria are purposeful in page layout, in which it considers the spatial relationships between items on the page and structure the page based on importance (Morville & Rosenfeld, 2014). The rests are strategically used color and texture that can direct attention toward or redirect attention, the use of typography to create hierarchy and clarity (Morville & Rosenfeld, 2014 and Garrett, 2000). This supported criteria considers users in setting the different sizes of layout, fonts, and arrangement of the text to help increase scannability, legibility, and readability (Garrett, 2000).

2.7.3 Single Sign-On (SSO)

Single Sign-On (SSO) is the latest criteria in developing the successful portal in the perspective of software engineering. This criterion is an authentication process that allows a user to access multiple applications with one set of login credentials (Patil, Pandit & Patel, 2013 and Li et al., 2004). This criterion of the portal are connected to the multiple resources to a local area network (LAN) (Villanueva, 2014). The benefits of single sign-on can increase the portal productivity, reduces risk by minimizing bad password habits, reduces help desk costs, accelerates user adoption of company-promoted apps, and decreased security (Li et al., 2004).

2.8 Conclusion

This chapter reviews the related works in the literatures by emphasizing major contribution of the key success factors of portal implementation. The overview of the benefits of portal amongst the university environment which involved the users are the students, staff and collaboration of all departments in university institution. The investigations were then emphasized the concept of key success factor that recommended by Ronald Daniel of McKinsey and company. Then, the concept was recommended in Software Engineering and adapted as the key success factors of portal implementation to be contributed in this study. Finally, the investigations was determined several factors affecting the use of portal amongst student in university such as service performance, perceived usefulness, perceived ease of use and attitude were reviewed to support this study.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Research Methodology

This chapter discusses research framework, research hypotheses, research design including the variables and measurement, population and sample, data collection method and questionnaire design. The statistical techniques chosen to analyse the data are also focused in this chapter.

3.2 Research Framework

The research framework of this study is to investigate the relationship between student's perceived usefulness, perceived ease of use, and attitude towards using the UUM portal service performance. These elements are known as "Independent Variable" in this study. Besides, the portal service performance is defined as "Dependent Variable" in this study. The findings were contributed to the identification of the criteria of the success portal in UUM.

The research framework was adapted from Owen et al. (2001) and Waal (2007) to be relevant and used in this study. The study was continued to the issues that need to be highlighted in order to improve the quality and successful of university's portal. Thus, the perceived usefulness, perceived ease of use, attitudes towards using, and portal service performance are investigated. Figure 3.1 below presents the research framework in this study.

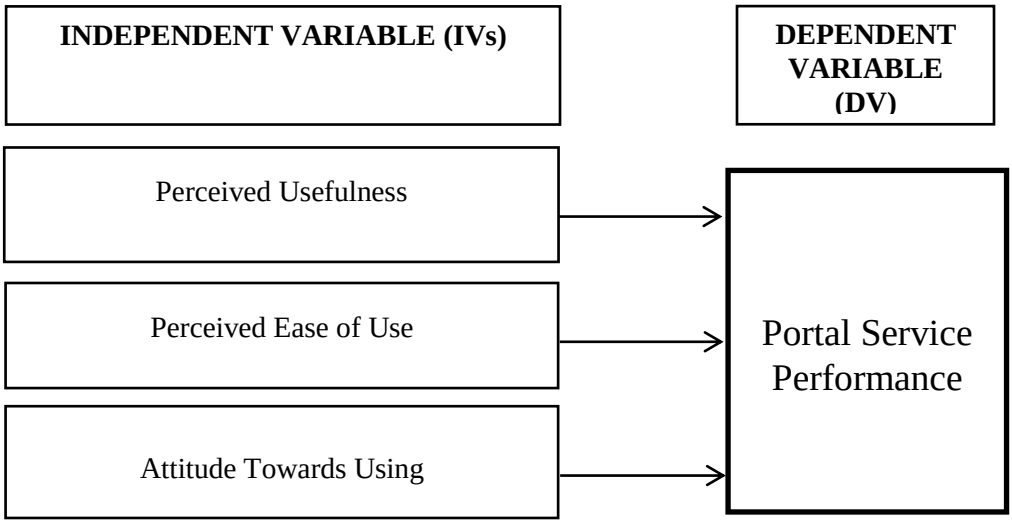

Figure 3.1. Research Framework of Student Satisfaction towards Using UUM Portal

3.3 Research Hypothesis

The research hypothesis in this study such as:

Hypothesis 1: Perceived Usefulness has significant relationship with Portal Service Performance

Hypothesis 2: Perceived Ease of Use has significant relationship with Portal Service Performance

Hypothesis 3: Attitude Towards Using has significant with Portal Service Performance

3.4 Research Design

The deductive approach is used as the research design in this study where the data is gathered from the grounded theories in the previous studies. This approach provides the theory, principles, and the concepts to support the findings of the research. According to Trochim (2006) suggest the benefits of deductive approach in the research due to it is relevant and suitable to develop the relationship of Independent Variable (IV) and Dependant Variable (DV) of the research.

3.4.1 Type of Study

The correlation research approach was used for this study. Correlation research is an approach where the researcher investigates the relationships between variables in a study with the belief that one variable affects the other variables. Cooper and Schindler (2011) defined causal research as "a study that is designed to determine whether one or more variables explain the causes of the effects of one or more outcome (dependent) variables." In addition, to answer the research questions regarding the causal relationship. Therefore, the causal research-based study provides a means to respond to the research questions. Hence, the main objective of this study is to obtain evidence or test hypothesis regarding cause and effect relationship between perceived usefulness, perceived ease of use, attitude towards using, and portal service performance.

3.4.2 Unit of Analysis

This study is an individual level research in Universiti Utara Malaysia. The main objective of this study is to examine the relationship between perceived usefulness, perceived ease of use, and attitude towards using with portal service performance. Hence, this study used individual (students) as a unit of analysis.

3.4.3 Population

The main objective of this study is to examine the relationship perceived usefulness, perceived ease of use, attitude towards using, and portal service performance. Therefore, the population in this study comprises 2,400 students of College of Business (COB), Universiti Utara Malaysia consists of the local and international students.

3.4.4 Minimum Sample Size

To identify the minimum sample size for the students, this study used "10 times" thumb rule as this approach was regularly used as the guideline to estimate the minimum sample size required (Peng & Lai, 2012). According to Hair, Ringle, and Sarstedt (2011), PLS-SEM can be utilised with smaller sample size. Hence, the minimum sample size required in a PLS-SEM path modeling is determined by multiplying the maximum number of structural paths pointing at an endogenous variable (dependent variable) in the structural model by 10. The theoretical framework of the current study comprises four independent variables, As such, the minimum sample size for this study was calculated as 80 students based on the maximum ten arrows pointing toward Portal Service Performance in the structural model.

3.4.5 Sampling Method

This study used simple random sampling. The Simple Random Sampling is a sampling technique where in every item of the population has an equal and likely chance of being selected in the sample. Simple random sampling is the purest and the most straight forward probability sampling strategy. It is also the most popular method for choosing a sample among population for a wide range of purpose.

The sampling design in this study is depend on the population, sampling size and method of analyzed used such as probability and non-probability sampling design (Cavana et al., 2001). In this study was selected the non-probability sampling design in which the planning are more dependable and could offer an important lead to potentially useful information with regard to the population. According to Bailey's

(2008) and Sekaran (2003) describes the minimum sample size for statistical analysis is 30 and maximum to 100 of participants.

3.5 Data Collection Method

A survey by questionnaires was used in this study. As such, data collected via structured questionnaires to measure the variables under the study. The questionnaires were distributed and collected from respondents within two months' time frame. The aim population of this study contains all students in Universiti Utara Malaysia. Data collection adopts an approach whereby the survey is personally administered, but self-completed.

3.6 Questionnaire Development

A combination of existing validated measurements, extensive literature review (items as conceptualised by the authors) and with the help of academic and industry experts were utilised to develop an instrument for this research. The development of questionnaire in this study is based on the previous studies such as Erasmus et al. (2015), Chang (2004), and Li (2010). On top of that, the factors involved in this study were enhanced as adapted from these previous studies. The survey is presented in the Appendix.

3.7 Survey Instrument

This study used self-administrated questionnaires consisting four questions for section A and three questions for section B. Questionnaires are designed in focusing on items and variables as discussed in Chapter 2. While in section C, it contains 34 questions.

3.8 Data Analysis

The data analysis of this study consists of descriptive analysis, Partial Least Squares Structural Equation Modelling (PLS), measurement model assessment and structural model assessment. There are elaborated further.

3.8.1 Descriptive Analysis

According to Sekaran and Bougie (2013), descriptive analysis is used to report a profile or described the basic features of the variables of interest in a study. In this study, SPSS Version 22.0 was used for the first phase of the data analysis. Therefore, the data analysed using SPSS would be subjected to descriptive statistics to identify their frequencies, means, and standard deviations. In addition, a descriptive statistic in this study focused on individual demographic such as age, gender, marital status, educational qualification, frequency of use and the degree of agreements of using portal amongst students in UUM. Hence, the descriptive statistics were used to describe essential features of these data in a study. Also, these descriptive statistics provided simple summaries about the sample and the measurement.

3.8.2 Partial Least Squares Structural Equation Modelling

This study used the Partial Least Squares (PLS) - Structural Equation Modelling (SEM) at the second phase of the data analysis, which is one of the Structural Equation Modelling (SEM) techniques. According to Hair, Sarstedt, Hopkins, and Kuppelwieser (2014), PLS-SEM is another generation data analysis techniques that analyse and describe research model by several variables or constructs. In addition, as mentioned by Hair et al. (2014), PLS-SEM is a variance-based approach, which allows the concurrent analysis of maximum 200 variables, hence, letting the

investigation of broad interactions among antecedent, independent, and dependent variables (Al-Gahtani, Hubona, & Wang, 2007).

3.8.3 Measurement Model Assessment

The measurement model assessment provided in this study consists of construct validity, convergent validity, discriminant validity, and reliability of a measure. There are elaborated further.

3.8.3.1 Construct Validity

According to Sekaran and Bougie (2013), construct validity is the suitability of the instrument used to measure the concept as hypothesised. Moreover, it establishes the degree of alignment between the variables in empirical study and original constructs in theory (Edgar, Mayer, & Scharff, 2009). Therefore, the key factor in the conducting a rigorous empirical study is the high construct validity (Edgar et al., 2009). In 2010, Hair, Black, Babin, and Anderson, suggested validity value is more than 0.50, thus, if the indicator is equal to 0.70 and above, it is considered good. In addition, the study can use convergent validity and discriminant validity to evaluate the construct validity (Sekaran & Bougie, 2013).

3.8.3.2 Convergent Validity

According to Li and McCabe (2013), convergent validity is the relationship between measurements of the similar construct and is calculated by the average variance extracted (AVE). Therefore, with the expectation-maximum 50 percent of the variance construct can be explained by the same indicators, rather than by measurement errors, the validity of individual measurements is acceptable if the

AVE is at least 0.50 (Fornell & Larcker, 1981). In addition, Hair, Hult, Ringle and Sarstedt (2014) suggested the value of loading values is 0.50 and above to indicate its substantial validity, AVE should be higher than 0.50, and composite reliability must be greater than 0.70. Therefore, the maximum of loading value is 0.60 and recommended that the criterion for convergent validity is the loading value above 0.70, and those below 0.50 should be avoided (Hair et al., 2010).

3.8.3.3 Discriminant Validity

According to Sekaran and Bougie (2013), discriminant validity is the degree to which measures of diverse concepts are not connected to each other. Verification of the discriminant validity can be done by examining the cross-loadings of the indicators or the square root of the AVE value (Hair et al., 2014). Precisely, an indicator's main loading has to be larger than all of its cross-loadings, and the AVE of the latent variables ought to be greater than the squared correlation with any other latent variables (Hair et al., 2014). This study confirmed the discriminant validity of the measurement framework for reflective constructs over the evaluation of the heterotrait-monotrait ratio of correlations (HTMT) as suggested by Henseler, Ringle, and Sarstedt (2015). According to Henseler et al. (2015), using HTMT as a criterion to access discriminant validity, the researcher needs to compare it to a predefined threshold. Therefore, if the value of the HTMT is greater than it predefined threshold, the researcher can conclude that there is a non-existence of discriminant validity. This study used a conservative threshold of 0.85 as suggested by Clark and Watson (1995) and Kline (2015).

3.8.3.4 Reliability

The reliability of a measure refers to the stability and consistency of the instrument in measuring the concept (Sekaran & Bougie, 2013). According to Hair et al. (2010), a measurement is reliable when an instrument constantly measures what it intended to measure. In addition, Cronbach's alpha is a popular reliability index, and it has become a standard tool used by researchers to measure the reliability of a questionnaire measurement (Peterson & Kim, 2013). Therefore, the value of Cronbach's alpha above 0.70 is considered moderately acceptable (Nunnally & Bernstein, 1978). Nevertheless, Cronbach's alpha has been criticised for underestimating reliability due to its lower bound of true reliability (Peterson & Kim, 2013). As a result, composite reliability which does not require indicators to be equally reliable has become the primary criterion of choice for a measure of reliability (Hair et al., 2014). Additionally, according to Hair et al. (2010), a composite reliability of 0.70 or above is considered acceptable.

3.8.4 Structural Model Assessment

Following the assessment of the measurement model to ensure that the measures used are valid and reliable, the structural model was assessed. Therefore, the first step in the structural model assessment was examining the collinearity between the exogenous variables. Secondly, it involved examining the significance of the path coefficients and the model's predictive accuracy. In addition, the effect size was examined and finally, the predictive relevance of the model was examined.

3.8.4.1 Collinearity Assessment

Collinearity occurs when two independent variables are highly correlated while multicollinearity occurs when an independent variable is highly correlated with a set of other independent variables (Hair et al., 2014). Furthermore, collinearity occurs if the variance inflation factor (VIF) is above 5 or the tolerance value is below 0.20 (Hair et al., 2014). The assessment of collinearity or multicollinearity is necessary because as collinearity increases, the unique variance explained by each independent variable on the dependent variable decreases and the shared prediction percentage upsurges (Hair et al., 2010).

3.8.4.2 Structural Model Path Coefficients

The path coefficients were computed for the hypothesised relationship between the variables. The path coefficients have a value between -1 and +1. Hence, it helps to determine whether the hypothesised relationship is positive or negative (Hair et al., 2014). In addition, a path coefficient with a value closer to +1 means a strong positive relationship; a value closer to -1 means a strong negative relationship; and a value closer to 0 means that there is no relationship (Hair et al., 2014). Therefore, the significance of the structural paths was assessed by checking the path coefficients and the *t* values. To obtain the *t* values, bootstrapping was performed.

According to Hair et al. (2014) since PLS-SEM does not assume a normal distribution. Therefore, this study must apply the bootstrapping routine to define the level of significance of every indicator weight. Their defined bootstrapping "is a resampling technique that draws a large number of subsamples from the original data (with replacement) and estimates models for each subsample" (Hair et al., 2014).

3.8.4.3 Coefficient of Determination

The coefficient of determination ($R^{2)}$ was assessed to determine the predictive accuracy of the model. The R^2 is calculated as the Pearson's squared correlation between the actual and predictive values of a dependent variable (Hair et al., 2014). The values of R^2 range from 0 to 1 where a value close to 1 shows that the model has a stronger predictive accuracy signifying that more of the dependent variable's variance is explained by the independent variables. Hence, the rule of thumb is that R^2 higher than 0.02 is considered small, higher than 0.13 is considered medium and higher than 0.26 is considered large (Cohen, 1988).

3.9 Summary

This chapter discusses the methodology used in this study. It delivers a brief understanding into the unit of analysis, population, sampling method, and size. Thus, the survey instrument used to collect data in this study which consists of three sections such as *Demography*, *Frequency of use* and the *Degree of Agreement* of using portal amongst the students in UUM. Then, for the first phase of the data analysis, the findings from the exploratory study are analyzed using SPSS Version 22.0. The data are analysed with focused to the descriptive statistics to identify their frequencies, means, and standard deviations. In the second phase, the Partial Least Squares (PLS) - Structural Equation Modelling (SEM) is used to support in analysing the findings. Moreover, this chapter also discusses on the measurement model assessment which consists of construct validity, convergent validity, discriminant validity, and reliability of a measure. In order to ensure the measures used are valid and reliable, the structural model was assessed to support the validity, relaibility and practicality of the data.

CHAPTER FOUR
FINDINGS

4.1 Introduction

This chapter presents and discusses data analysis results from the survey conducted to explore the link between perceived usefulness, perceived ease of use, and attitude towards using towards portal service performance in University Utara Malaysia. Firstly, this chapter discusses the finding of response rate, the characteristics of the respondents and the outcome of the perceived usefulness, perceived ease of use, and attitude towards using gathered from the survey. Secondly, this chapter discusses the statistical results from the PLS-SEM analysis, which comprises both the measurement model and the structural model. Furthermore, the measurement model presents the results of the validity and reliability of the measurements used in the study. Next, the structural model presents the result of the collinearity assessment and hypotheses testing.

4.2 Response Rate

A total of 120 respondents from 2,400 students of COB are willing to participate to answer the survey instrument. Based on the total of agreed respondent participated, only 98 respondents which is 81.7% who are successfully completed the survey. While, 22 respondents (18.3%) are rejected because of failed to complete the survey. The overview of respondents represented in Table 4.1 below.

Table 4.1

Overview of Respondent

Details	**Details**	**Percentage**
Number of respondents willing to participate	120	100%
Face-to-face respondents	98	81.7%
Rejected/ Incomplete survey	22	18.3%
Total of completed survey	98	81.7%

4.3 Respondents' Profile

The demographic of the respondents are male 27 respondents and stated at 27.6 percent. While, a total of 71 respondents are female is pointed at 72.4 percent. The marital status is single (100 percent). On average, respondents were in the range of 20 to 30 years old (100 percent). Regarding the educational level, most of the respondents have a Bachelor Degree (81.6 percent), follow by a Diploma (13.3 percent), Sijil Tinggi Pelajaran Malaysia (4.1 percent) and Sijil Tinggi Agama Malaysia (1.0 percent). Therefore, all respondents were single. The results were presented in Figure 4.1 below.

Demographic	Frequency	%
• Gender		
✓ Male	27	27.6
✓ Female	21	72.4
• Age		
✓ 20-30	98	100.0
• Marital Status		
✓ Single	98	100.0
• Highest Educations		
✓ Diploma	13	13.3
✓ Degree	80	81.6
✓ STPM	4	4.1
✓ STAM	1	1.0

Figure 4.1. Respondents' Profile

4.4 Respondents' Frequency of Use

The frequency of use of the respondents were examined based on the frequency of using the UUM portal, hours of using UUM portal, and the preferred time of surfing UUM portal amongst the students. Based on the investigations, the frequency of use involved 65.3 percent of using between 1 to 10 times per week. While, a total of 29.6 percent were 11 to 20 times per week and 4.1 percent of using portal between 21 to 30 times per week. The rest only 1.0 percent of students were used portal more than 31 times per week. Figure 4.2 illustrates the results.

Valid	1-10 per week	64	65.3	65.3	65.3
	11-20 per week	29	29.6	29.6	94.9
	21-30 per week	4	4.1	4.1	99.0
	More than 31 per week	1	1.0	1.0	100.0
	Total	98	100.0	100.0	

Figure 4.2. Results of Frequency of using UUM Portal

Furthermore, the hours of using portal by the respondents were less than 1 hour per week as the largest results pointed at 52 percent. It is followed by 41.8 percent for using portal in between 1 to 5 hours per week, and 4.1 percent involved 6 to 10 hours of using portal per week. The least result is only 2 percent of the respondents were surfing portal more than 10 hours per week. Figure 4.3 describes the results.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 hour per week	51	52.0	52.0	52.0
	1-5 hours per week	41	41.8	41.8	93.9
	6-10 hours per week	4	4.1	4.1	98.0
	More than 10 per week	2	2.0	2.0	100.0
	Total	98	100.0	100.0	

Figure 4.3. Results of Hours of using UUM Portal

Additionally, the results were presented the time of the respondents preferred to use UUM' portal is on the night and at any time they preferred are stated at 58.2 percent and 30.6 percent respectively. While, the respondents were chose at evening time to surf the portal which is 5.1 percent. It is followed by morning and noon as their preferred time to surf the portal and pointed at 3.1 percent and 2 percent respectively. Whilst, only one percent of the respondents who are willing to surf portal at midnight. Figure 4.4 reporting the results.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Morning	3	3.1	3.1	3.1
	Noon	2	2.0	2.0	5.1
	Evening	5	5.1	5.1	10.2
	Night	57	58.2	58.2	68.4
	Any time	30	30.6	30.6	99.0
	Other:Please Specify = Midnight	1	1.0	1.0	100.0
	Total	98	100.0	100.0	

Figure 4.4. Results of Preferred Time of Surfing UUM Portal

4.5 Finding of Respondent Perception Towards Using Portal

This section was asked the respondents regarding the respondent's perception, opinion and experience based on their behavioral on using the portal. The mean and degree of agreement based on the selected practices are counted. The 5-point statistical ranges was used for this question, which ranged from *Strongly Agree* to *Strongly Dis-Agree* (Zikmund et al., 2010). This scale was then mapped to equal intervals. The interval ranges are calculated by using the following formula (Ismail, Abedlazeez, & Hussin, 2011) as depicted below:

Interval ranges = (n-1) / n (Eq. 4.1)

Where n is the maximum number in the used scale, which is n equal to 5. Table 4.2 shown the interval ranges values, where the ranges value level between one through five is (5-1) /5 equal to 0.80.

Table 4.2

Degree of Agreement and Interval Values

Degree of Agreement (DI)	**Interval Values**
Strongly Agree	1.00 – 1.80
Moderately Agree	1.81 – 2.61
Slightly Agree	2.62 – 3.42
Moderately Agree	3.43 – 4.23
Strongly Agree	4.24 - 5.00

4.5.1 Perceived Usefulness

A total of 32 (32.7%) respondents were moderately agree the using UUM portal can improve the quality of the registration process. It is followed by 37 (37.8%) respondents were slightly agree that using UUM portal gave their greater control over the registration process. A total of 31 (31.6%) respondents also slightly agree that using UUM portal can support any critical aspects of their registration process. Additionally, the same respondents also slightly agree with using UUM portal allowed them to accomplish more works by using portal that pointed at 31 (31.6%). Majority of them 30 (30.9%) were slightly agree that UUM portal made them easy to make a class registration. Overall, the 32 (33%) respondents slightly agree that UUM portal is usefulness for class registration with average of 2.80. Table 4.3 presents the finding of the mean and degree of agreement for each measurement practices for perceived usefulness.

Table 4.3

Perceived Usefulness

No	Measurement Practices	Likert Scale					Mean	Average	Degree of Agreement
		SA (1)	MA (2)	SlA (3)	MDA (4)	SDA (5)			
		F	F	F	F	F			
		%	%	%	%	%			
1	Using UUM portal improved the quality of the registration process	17 17.3	32 32.7	31 31.6	13 13.3	5 5.1	2.56	**2.80**	**Slightly Agree**
2	Using UUM portal gave me greater control over the registration process	11 11.2	27 27.6	37 37.8	19 19.4	4 4.1	2.78		
3	UUM portal enabled me to accomplish the registration task more quickly	10 10.2	26 26.5	31 31.6	20 20.4	10 10.2	2.94		
4	UUM portal supports critical aspects of my registration process	7 7.1	30 30.6	31 31.6	24 24.5	4 4.1	2.88		
5	Using UUM portal allowed me to accomplish more work than would otherwise be possible	8 8.2	32 32.7	33 33.7	18 18.4	5 5.1	2.79		
6	Using UUM portal increased the effectiveness of the registration process	12 12.4	27 27.8	31 32	20 20.6	7 7.2	2.82		
7	UUM portal made it easier for me to register for classes	14 14.4	27 27.8	30 30.9	14 14.4	12 12.4	2.82		
8	Overall, I find the UUM portal system useful for class registration	10 10.3	32 33	31 32	15 15.5	9 9.3	2.80		

4.5.2 Perceived Ease of Use

Based on the findings, majority of the respondents were slightly agree to use portal with the average of 2.68. A total of respondents 38 (38.8%) were response positive on learning to use the UUM portal system was easy to them. While, they admitted

that UUM portal is interacted and not disappointed the users based on their provided functions. A total of 30 (30.6%) of respondents were slightly agree on this statement. Moreover, a total of 41 (41.8%) respondents were slightly agreed that UUM portal is easy to use to handle the respondent's purposes and only 6 (6.1%) of respondents were strongly agreed that UUM portal is rigid and inflexible to interact with.

Additionally, a total of 38 (38.8%) respondents were moderately agreed that UUM portal is easy to remember the tasks and functions provided by this services and they admitted that the interaction with UUM portal was clear and understandable. Furthermore, UUM portal is easy to use in finding the information. The finding on this statement is moderately agreed by 38 (39.8%) respondents. Hence, a total of 38 (39.2%) were slightly agreed that UUM portal system has alerted to any error occurred and will inform to the users about the faults if any. Thus, a total of 44 (44.9%) of respondents were moderately agreed that UUM portal made them easy to select between alternative courses. Table 4.4 presents the finding of the mean and degree of agreement for each measurement practices for perceived ease of use.

Table 4.4

Perceived Ease of Use

No	Measurement Practices	Likert Scale					Mean	Average	Degree of Agree-ment
		SA (1)	MA (2)	SlA (3)	MDA (4)	SDA (5)			
		F	F	F	F	F			
		%	%	%	%	%			
1	Learning to use the UUM portal system was easy for me	18 18.4	38 38.8	23 23.5	14 14.3	5 5.1	2.49	**2.68**	**Slightly Agree**
2	Interacting with the UUM portal system was often frustrating.	10 10.2	14 14.3	39 39.8	30 30.6	5 5.1	3.06		
3	I found it easy to get UUM portal to do what I want to do	9 9.2	28 28.6	41 41.8	20 20.4	-	2.73		
4	UUM portal is rigid and inflexible to interact with	6 6.1	24 24.7	41 42.3	22 22.7	4 4.1	2.94		
5	It is easy for me to remember how to perform tasks using UUM portal	13 13.3	38 38.8	30 30.6	14 14.3	3 3.1	2.55		
6	My interaction with UUM portal was clear and understandable	11 11.2	38 38.8	33 33.7	13 13.3	3 3.1	2.58		
7	I find it takes a lot of effort to become skillful at using UUM portal	4 4.1	28 28.6	32 32.7	19 19.4	15 15.3	3.13		
8	It was easy for me to find information on the UUM portal site	18 18.4	39 39.8	27 27.6	11 11.2	3 3.1	2.41		
9	The UUM portal system indicated to me when an error occurred	8 8.2	32 33.0	38 39.2	15 15.5	4 4.1	2.74		
10	The UUM portal system made it easy for me to select between alternative courses	12 12.2	44 44.9	25 25.5	11 11.2	6 6.1	2.54		
11	Overall, I found UUM portal easy to use	17 17.3	41 41.8	25 25.5	9 9.2	6 6.1	2.45		

4.5.3 Attitude Towards Using

Based on the findings, a total of 39 (39.8%) respondents were slightly agreed that studying through UUM portal is a good idea. The same results of slightly agreed resulted by 33 (33.7%) respondents on studying through UUM portal is a wise idea. Thus, 48 (49%) respondents were also slightly agreed that they were positive towards using UUM portal. While, they were slightly agreed on interacting with UUM portal required them a lot of mental effort. However, only 2 (2%) respondents were strongly disagreed on this statement. Table 4.5 presents the finding of the mean and degree of agreement for each measurement practices for attitude towards using.

Table 4.5

Attitude Towards Using

No	Measurement Practices	Likert Scale					Mean	Average	Degree of Agreement
		SA (1)	MA (2)	SlA (3)	MDA (4)	SDA (5)			
		F	F	F	F	F			
		%	%	%	%	%			
1	Studying through UUM portal is a good idea	8 8.2	22 22.4	39 39.8	24 24.5	5 5.1	2.59	**2.61**	**Moderately Agree**
2	Studying through UUM portal is a wise idea	5 5.1	23 23.5	33 33.7	32 32.7	5 5.1	2.62		
3	I am positive toward using UUM portal	5 5.1	22 22.4	48 49.0	21 21.4	2 2.0	2.40		
4	Interacting with UUM portal required a lot of mental effort	8 8.2	22 22.4	46 46.9	20 20.4	2 2.0	2.82		

4.6 Hypothesis Testing

The findings of the surveys were also analyzed to determine whether there were significant differences or relationships between the selected variables. The Pearson

Correlation method is used to analyze and determine the relationship between the variables. The findings of the significant differences or the relationship between the selected variables are elaborated further.

4.6.1 H1: The relationship between Perceived Usefulness and Portal Service Performance

Based on Table 4.7, the findings shown the relationship between perceived usefulness and portal service performance is strongly and significant, where the results revealed R^2 is 0.725. From the results view, the correlation coefficient of the variable pair is high at r = .846 because it approximates to value 1. It also proves that this variable has a positive relationship. However, the result shows that there is a significant relationship between the perceived usefulness and portal services performance variables where the significant value is p = .002 which is smaller than the significant level. Therefore, H1 is accepted.

Table 4.7

The Relationship between Perceived Usefulness and Portal Service Performance

Path	Standard Deviation	T Statistics	P Values	Decision	R^2
PU -> PP	0.068	3.128	0.002	**Accept**	0.725

Correlation is significant at the 0.01 level (2-tailed).

4.6.2 H2: The relationship between Perceived Ease of Use and Portal Service Performance

Based on Table 4.8, the findings shown the relationship between perceived ease of use and portal service performance is strongly and significant, where the results revealed R^2 is 0.738. From the results view, the correlation coefficient of the variable pair is high at r = .859 because it approximates to value 1. It also proves that this

variable has a positive relationship. However, the result shows that there is a significant relationship between the perceived ease of use and portal services performance variables where the significant value is p = .000 which is smaller than the significant level. Therefore, H2 is accepted.

Table 4.8

The Relationship between Perceived Ease of Use and Portal Service Performance

Path	Standard Deviation	T Statistics	P Values	Decision	R^2
PEU -> PP	0.112	5.129	0.000	**Accept**	0.738

Correlation is significant at the 0.01 level (2-tailed).

4.6.3 H3: The relationship between Attitude Towards Using and Portal Service Performance

Based on Table 4.9, the findings shown the relationship between the attitude towards using and portal service performance is strongly and significant, where the results revealed R^2 is 0.736. From the results view, the correlation coefficient of the variable pair is high at r = .857 because it approximates to value 1. It also proves that this variable has a positive relationship. However, the result shows that there is a significant relationship between the attitude towards using and portal services performance variables where the significant value is p = .003 which is smaller than the significant level. Therefore, H3 is accepted.

Table 4.9

The Relationship between Attitude Towards Using and Portal Service Performance

Path	Standard Deviation	T Statistics	P Values	Decision	R^2
ATU -> PP	0.078	2.950	0.003	**Accept**	0.736

Correlation is significant at the 0.01 level (2-tailed).

4.6.4 Summary of Hypothesis Testing Results

The findings of hypothesis testing is summarized in Table 4.10 consists of four hypothesizes that involved all variables used in this study.

Table 4.10

Hypothesis Testing Results

No	Hypothesis	Results
H1	There is a significant relationship between perceived usefulness and portal service performance	Accepted
H2	There is a significant relationship between perceived ease of use and portal service performance	Accepted
H3	There is a significant relationship between attitude towards using and portal service performance	Accepted

4.7 Partial Least Squares Structural Equation Modelling

This study used Partial Least Squares (PLS) Structural Equation Modeling (SEM) at the second phase of the data analysis, which is a variance-based Structural Equation Modelling (SEM) techniques. As part of the PLS-SEM analysis, the measurement model was assessed first and followed by the structural model. The measurement model was assessed to identify the validity and reliability of the measurements used in the study. Furthermore, the structural model was assessed to determine the presence of collinearity among the exogenous variables, to determine the significance of the relationship between the variables, to determine the effect size, and to determine the predictive relevance of the model.

4.8 Measurement Model Assessment

Measurement model was assessed to determine the validity and reliability of the measurements. Therefore, the measurement model can be examined using the SmartPLS Software by running the PLS algorithm. In addition, the running of the PLS algorithm generated the factor loadings, path coefficients, the coefficient of determination, and the validity and the reliability measures for the model. Validity refers to whether an instrument that is developed to measure a concept measures that concept (Sekaran & Bougie, 2013) and reliability refers to the accurateness and consistency of measuring instruments and is a required condition for validity (Kerlinger & Lee, 1986).

4.8.1 Construct Validity

Construct validity refers to the "correspondence between a construct and a measure as evidence of the construct" (Edwards & Greenberg, 2003). Therefore, it establishes the degree of alignment between the variables in empirical study and original constructs in theory (Edgar et al., 2009). Hence, construct validity evaluated over the convergent validity and discriminant validity (Sekaran & Bougie, 2013).

4.8.2 Convergent Validity

Convergent validity refers to the degree to which the measure correlates with further measures that were designed to measure the identical thing (Yi, 2009). To establish convergent validity, factor loading of the indicators, the average variance extracted (AVE) and composite reliability (CR) should be considered (Hair et al., 2014). Therefore, the recommended rule of thumb of the standardized loading estimates is that it should be higher than 0.70 and those below 0.50 should be avoided (Hair et

al., 2010). Table 4.11 depicts the cross-loadings for an individual items between the constructs, while Table 4.12 presents the outer loadings of the items for each construct. As discussed above, no indicators have loadings that were below than 0.50.

Besides the outer loadings, the AVE was also examined. AVE is a summary indicator of convergence, and it denotes to the mean-variance extracted for the items loading on a construct (Hair et al., 2010). Therefore, with the expectation-maximum 50 percent of the variance construct can be explained by the same indicators, the validity of individual measurements is acceptable if the AVE is at least 0.50 (Fornell & Larcker, 1981). From the Table 4.12, the AVEs for all constructs were above 0.50. Therefore, the measurement used in this study proved adequate convergent validity.

Table 4.11

Loadings and Cross Loadings

	ATU	PEU	PP	PU
ATU1	**0.806**	0.502	0.488	0.428
ATU2	**0.860**	0.574	0.560	0.486
ATU3	**0.839**	0.750	0.699	0.629
ATU4	**0.621**	0.415	0.519	0.255
PEU1	0.485	**0.569**	0.524	0.369
PEU2	0.644	**0.776**	0.621	0.643
PEU4	0.603	**0.798**	0.672	0.673
PEU6	0.585	**0.752**	0.606	0.634
PUE7	0.580	**0.808**	0.622	0.594
PUE8	0.339	**0.395**	0.403	0.248
PUE9	0.677	**0.863**	0.762	0.656
PUE10	0.590	**0.801**	0.686	0.611

PUE11	0.482	**0.803**	0.659	0.571
PUE12	0.651	**0.859**	0.699	0.594
PUE13	0.562	**0.766**	0.589	0.564
PUE14	0.543	**0.828**	0.626	0.663
PUE15	0.551	**0.841**	0.682	0.724
PUE16	0.562	**0.828**	0.616	0.728
PP1	0.633	0.695	**0.854**	0.554
PP2	0.605	0.740	**0.872**	0.558
PP3	0.664	0.740	**0.874**	0.587
PP4	0.622	0.637	**0.840**	0.449
PU1	0.492	0.717	0.567	**0.871**
PU2	0.564	0.716	0.570	**0.862**
PU3	0.538	0.643	0.563	**0.855**
PU4	0.498	0.608	0.505	**0.832**
PU5	0.436	0.671	0.506	**0.813**
PU6	0.473	0.629	0.506	**0.885**
PU7	0.462	0.607	0.495	**0.843**
PU8	0.546	0.687	0.542	**0.852**

Table 4.12

Results of Measurement Model (Summary of Constructs Validity and Reliability of the Latent Constructs)

Constructs	Standard Beta	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
ATU	0.808	0.790	0.865	0.620
PEU	0.952	0.945	0.953	0.598
PP	0.884	0.883	0.919	0.740
PU	0.947	0.946	0.955	0.726

4.8.3 Discriminant Validity

Discriminant validity refers to the degree to which a given construct differ from other similar constructs designed to measure different things (Yi, 2009). Therefore, a construct has discriminant validity when it is empirically tested to be distinct from other constructs (Hair et al., 2014). Verification of the discriminant validity can be done by examining the cross-loadings of the indicators, the square root of the AVE value (Hair et al., 2014) and the evaluation of the HTMT (Henseler et al., 2015). According to Henseler et al. (2015), using HTMT as a criterion to access discriminant validity, the researcher needs to compare it to a predefined threshold. Hence, if the value of the HTMT is greater than it predefined threshold, the researcher can conclude that there is a non-existence of discriminant validity. This study used a conservative threshold of 0.85 as suggested by Clark and Watson (1995) and Kline (2015). As shown in Table 4.13 below, the HTMT value for each construct below than the threshold of 0.85, therefore, the measurement used for this study demonstrated adequate discriminant validity.

Table 4.13

Discriminant Validity (Heterotrait-Monotrait Ratio (HTMT)

	ATU	PEU	PP	PU
ATU				
BI	0.764			
PEU	0.831			
PP	0.816	0.806		
PU	0.662	0.816	0.681	

4.8.4 Reliability

Reliability refers to consistency and stability of an instrument in measuring a concept when it repeatability over time (Sekaran & Bougie, 2013). Cronbach's alpha (CA) is a popular reliability index, and it has become a standard tool used by researchers to measure the reliability of a questionnaire measurement (Peterson & Kim, 2013). A Cronbach's alpha value of at least above 0.70 is considered moderately acceptable (Nunnally & Bernstein, 1978). However, Cronbach's alpha has been criticised for underestimating reliability due to its lower bound of true reliability (Peterson & Kim, 2013). Therefore, composite reliability, which does not require indicators be equally reliable has become the primary criterion of choice for a measure of reliability (Hair et al., 2014). Furthermore, according to Hair et al. (2010), a composite reliability of 0.70 or above is deemed acceptable. As it is shown in Table 4.12, the composite reliability for all constructs was above the recommended value of 0.70. Therefore, the instruments used in this study were reliable.

4.9 Structural Model

After the measurement model was evaluated, the next step is to assess the structural model.

4.9.1 Path Coefficients and Coefficients of Determination

The structural paths in the structural model were assessed to determine the significance of the path coefficients. Therefore, the significance of the structural paths was assessed by checking the path coefficients and the *t* values. In addition, to test the hypotheses, the PLS algorithm and bootstrapping were performed. Hence, the path coefficients and R^2 were gained from the PLS algorithm, while the *t* values were gained from the bootstrapping. Figure 4.5 as below shows the path coefficients for each path as well as the R^2 value for each endogenous variable.

Additionally, the bootstrapping was run based on the 5,000 re-samples as recommended by Hair et al. (2014). A total of four hypotheses were tested in the structural model, and the output of the hypotheses testing is shown in Table 4.14.

Table 4.14

Summary of Path Coefficient and Hypothesis Testing

Path	Beta	Standard Deviation	T Statistics	P Values	Decision	R^2
ATU -> PP	0.224	0.078	2.950	0.003	**Accept**	
PU > PP	0.217	0.068	3.128	0.002	**Accept**	0.732
PEU -> PP	0.572	0.112	5.129	0.000	**Accept**	

Note: *p=5% (t-statistic ≥ *1.645)* (based on one-tailed test with 5000 bootstrapping)

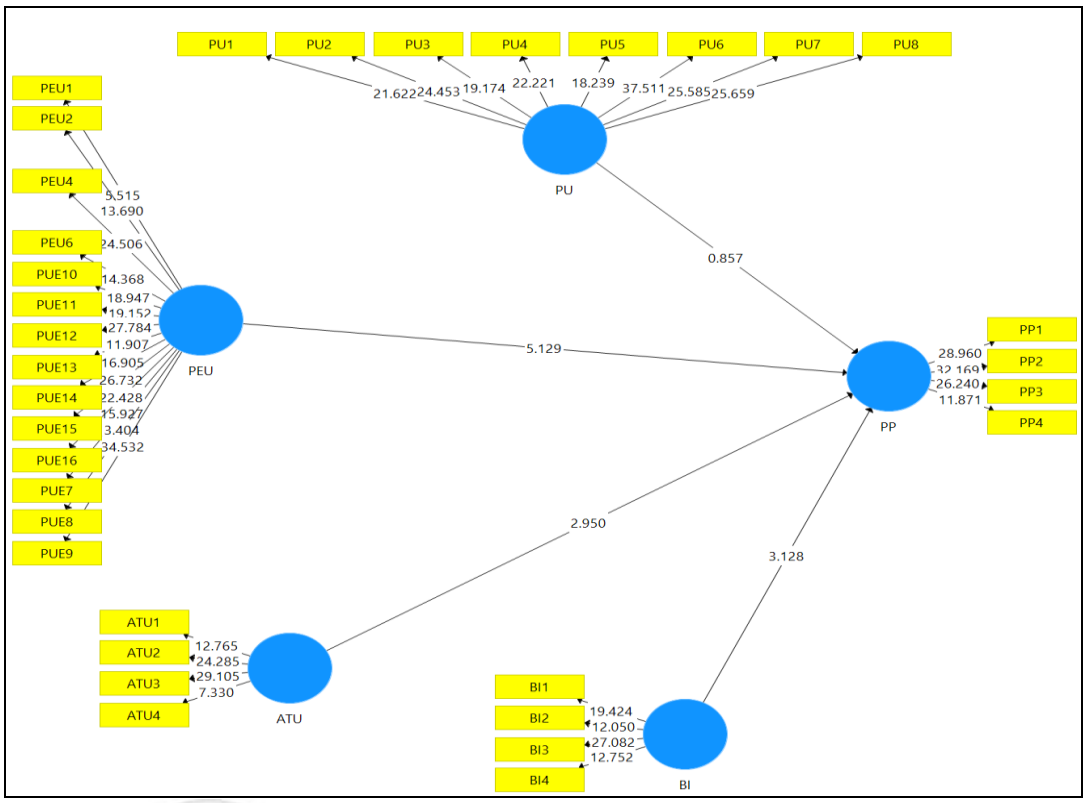

Figure 4.5. Structural Model of the Framework with t Values

Table 4.14 shows the path coefficients, standard errors, R^2 values, and the results of the hypotheses testing between perceived usefulness, perceived ease of use, attitude towards using and portal service performance. Furthermore, the R^2 was assessed from the structural model. The R^2 refers to the proportion of variance of the endogenous constructs explained by the exogenous variables (Hair et al., 2014). According to Cohen's (1988) rule of thumb, R^2 of 2 percent is considered small, R^2 of 13 percent is seen as medium, and R^2 of 26 percent is considered to be large. Therefore, the R^2 of portal service performance is 0.732 meaning that 73.2 percent of the variance in portal service performance was explained by the perceived usefulness, perceived ease of use, and attitude towards using. Hence, based on Cohen's (1998) rule of thumb, the R^2 for portal service performance is large because it is 73.2 percent.

Furthermore, bootstrapping of 5,000 re-samples was conducted to determine the path coefficient values and the t values for each path. Therefore, looking at each structural path, perceived usefulness, perceived ease of use and attitude towards using were found to have a significant relationship with portal service performance. Hence, H1, H2, and H3 were supported.

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CHAPTER FIVE
DATA ANALYSIS AND RESULT

5.1 Introduction

This chapter concludes the present study. It recapitulates the study and discusses the major findings of this research based on the results in Chapter Four. From the discussion, certain conclusions are drawn and possible implications are highlighted. This chapter closes with the limitations of this study and some recommendations are provided for future research.

5.2 Recapitulation of Study and Contribution

The main aim of this study is to investigate the key success factors of UUM portal. The investigation have been studied amongst the students of UUM as the main respondent in this study. The objectives of this study was developed, tested and validated based on the measurement scales to gain perceived usefulness, perceived ease of use, the attitude towards using with portal service performance. The results of findings has contributed to this research based on the developed hypothesizes. They were elaborated further.

1) To identify the relationship between student's perceived usefulness towards using UUM portal service performance

According to the first objective, the hypothesis one was constructed which is H1: the relationship between the perceived usefulness with the portal service performance. Based on the investigation, the results from this data analysis suggest that there are positive significant of relationship between perceived usefulness with portal service

performance. The findings stated that the relationship between perceived usefulness and portal service performance is strongly and significant and contributed to this study with the results revealed $\boldsymbol{R^2}$ is 0.725. From the results view, the correlation coefficient of the variable pair is high at r = .846 because it approximates to value 1. Thus, the hypothesis was accepted as there are a connection between the functionality and portability of the portal.

According to Lynch & Horton (2002) and Nielsen (2000) emphasizes that portal design and functionality shows that the fast response time is the most important form of the successful criteria in the website. These criteria had influenced the user to use the portal as it is provides the functionality that bring the usefulness to the users. The criteria of portal for example the pages that can be reached quickly and have predictable time-response provides usefulness to user and attractive them to use. However, the accessibility that makes it easy for students to find the information related to their requirements and the information provided get them easy to understand. Therefore, the perceived usefulness can support the portal service performance with efficiency and effectiveness and promotes the benefits to the university community.

2) To identify the relationship between student's ease of use towards using UUM portal service performance

According to the second objective, the hypothesis two was created which is H2: the relationship between the perceived ease of use with the portal service performance. Based on the investigation, the relationship between perceived ease of use and portal service performance is strongly and significant, where the results revealed $\boldsymbol{R^2}$ is 0.738. From the results view, the correlation coefficient of the variable pair is high at

r = .859 because it approximates to value 1. Findings contributed that the results have the significant relationships between students as the productive users with the ease of use of the UUM Portal.

The productive feature of the portal plays an important role in achieving the ease of use of the UUM Portal. According to Davis (1989) defines the perceived ease of use as the degree to which a person believes that using a particular system would be free of effort and will improve work performance and be more productive. The frequency of use will influence the perception to use of computers in workplace as a routine and will increase consumer productivity, improve work performance and improve work effectiveness and usability. In addition, Davis illustrates that the perceptions of exhaustion have a very important effect on the use and intentions of use. The results of this study were found to be in line with the results of the study conducted by Maslin (2008).

3) To identify the relationship between student's attitude towards using UUM portal service performance

According to the third objective, the hypothesis three was developed which is H3: the relationship between the attitudes towards using with the portal service performance. Based on the findings, the results contributed the relationship between the attitude towards using and portal service performance as strongly and significant, where the results revealed $\boldsymbol{R^2}$ is 0.736. It was also contributed that this variable has a positive relationship, where most of the respondents were moderately agreed with the average results of 2.61. This result stated that the UUM students have the positive attitude towards using the UUM portal by using the portal services to support their study. Thus, the result shows that there was a significant relationship between the attitude towards using and portal services performance, where the

significant value is p = .003 which is smaller than the significant level. Findings contributed that the results have the significant relationships and H3 was accepted.

5.3 Discussion and Limitation

This study has investigated the key success factors of UUM portal including the perceived usefulness, perceived ease of use, and attitude towards using with the portal service performance. The theoretical framework identified relevant variables and several hypotheses development which was established to investigate the relationship between the independent variable and dependent variable. All of these hypotheses were tested by using PLS –SEM version 2.0 analysis. Data was obtained from students who are studying in University Utara Malaysia (UUM). The response rate for the survey was 89 percent. Four hypotheses were formed to test the portal service performance. The hypotheses were tested by using PLS-SEM version 2 and SPSS version 22.0 analysis.

The results performed via assessing the reliability, convergent validity, discriminant validity has beneficially proof that the data involved in this study are tested and validated. The factors affecting on using portal were examined such as perceived usefulness, perceived ease of use, attitude towards using are significantly have the relationship towards portal service performance. The reliability and validity of the data have resulting more than 0.7 is significantly related to the portal service performance of this study. Therefore, this study had several limitations that need to be catered in future work. The limitations are elaborated further.

1. Lacked of reference sources related to the successful of the portal at the university level as well as the case studies that conducted research on the successful of a portal

at the university level. The main source of this study is focused on other academics technical writing, articles, journals, book chapters and blogs that obtained from academic websites, journals, and conferences in local and international sources.

2. The needs to expand the scope of respondents involved in this study, which is open to the staff of each department in UUM to take a part as the participants in this study. The larger scope of the respondents can produce the better results where the results are more accurate, efficiency and effectiveness to contribute in this study.

3. The needs to improve the survey instrument, where the elements in each criteria of success factors of UUM portal are required to be elaborated in depth views. For example, the measurement practices of the respondents in using the UUM portal should be measured in particularly towards improving the portal service performance in university level.

5.4 Conclusion

This study was conducted to investigate the key factors of portal with highlighting several criteria to improve and extend the reliability and flexibility of University's portal. This research has been explored the UUM portal based on the several criteria such as perceived usefulness, perceived ease of use, and attitude towards using with portal service performance amongst the UUM students. The significant of the study was beneficially to the UUM's students in supporting their satisfaction towards using the portal. Besides, this study provides the beneficial to the faculty and university's staff to be efficiently in providing the information to the users, while increase productivity, the features of the attractive portal and development tools to support the user requirements and satisfaction.

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Appendix A

Survey Questionnaire

This questionnaire is to collect the data in order to support my research proposal title "A Study on the Key Success Factors of UUM Portal". This questionnaire contains three (3) sections which are Section A is demography information, Section B is frequency of use and Section C is the measurement scale related to the successful of UUM portal amongst the UUM students. Kindly be answered the questions and it may take your time is about 10 to 15 minutes. Your consideration is highly appreciated.

Section A: Demography

1. Gender
   - Male
   - Female

2. Age
   - 20 – 30 years old
   - 31 – 40 years old
   - 41 – 50 years old

3. Marital Status
   - Single
   - Married
   - Divorce
   -

4. Highest Education Attainment
   - DIPLOMA
   - DEGREE
   - MASTER
   - PHD
   - Other: Please specify

……

Section B : Frequency of Use

5. Times using a portal
   - 1 – 10 times
   - 11 – 20 times
   - 21 – 30 times
   - Prefer not to answer
   - Other: Please specify

……..

6. Time online, hours
   - 1 – 5 hours
   - 6 – 10 hours
   - 11 hours or more
   - Prefer not to answer
   - Other: Please specify

……..

7. Appropriate time surfing UUM portal
   - Morning
   - Noon
   - Evening
   - Night
   - Any time

Other: Please specify

…….....

Section C :

Instruction: There are five (5) options on each item which are ***Strongly Agree, Moderately Agree, Slightly Agree, Moderately Disagree and Strongly Disagree***. Please tick to answer the appropriate scale for each item. Kindly provide suggestions where applicable.

No	Measurement	Strongly Agree (1)	Moderately Agree (2)	Slightly Agree (3)	Moderately Disagree (4)	Strongly Disagree (5)
Perceived Usefulness						
1	Using UUM portal improved the quality of the registration process					
2	Using UUM portal gave me greater control over the registration process					
3	UUM portal enabled me to accomplish the registration task more quickly					
4	UUM portal supports critical aspects of my registration process					
5.	Using UUM portal allowed me to accomplish more work than would otherwise be possible					
6	Using UUM portal increased the effectiveness of the registration process					
7	UUM portal made it easier for me to register for classes					
8	Overall, I find the UUM portal system useful for class registration					
Suggestion:						
Perceived Ease of Use		**Strongly Agree (1)**	**Moderately Agree (2)**	**Slightly Agree (3)**	**Moderately Disagree (4)**	**Strongly Disagree (5)**
9	I find UUM portal cumbersome to use					
10	Learning to use the UUM portal system was easy for me					
11	Interacting with the UUM portal system was often frustrating.					
12	I found it easy to get UUM portal to do what I want to do					
13	UUM portal is rigid and inflexible to interact with					
14	It is easy for me to remember how to perform tasks using UUM portal					
15	My interaction with UUM portal was clear and understandable					

16	I find it takes a lot of effort to become skillful at using UUM portal					
17	It was easy for me to find information on the UUM portal site					
18	I felt I always knew what stage of the registration process I was in					
19	The UUM portal system indicated to me when an error occurred					
20	The UUM portal system indicated to me when The registration process was complete.					
21	The UUM portal system made it easy for me to select between alternative courses					
22	Overall, I found UUM portal easy to use					
23	Overall, I found UUM portal easier to use than the prior registration system					
24	Overall, I found UUM portal more useful than the prior registration system					
Suggestion:						

Attitude Towards Using		**Strongly Agree (1)**	**Moderately Agree (2)**	**Slightly Agree (3)**	**Moderately Disagree (4)**	**Strongly Disagree (5)**
25	Studying through UUM portal is a good idea					
26	Studying through UUM portal is a wise idea					
27	I am positive toward using UUM portal					
28	Interacting with UUM portal required a lot of mental effort					
Suggestion:						

Behavioral Intention		**Strongly Agree (1)**	**Moderately Agree (2)**	**Slightly Agree (3)**	**Moderately Disagree (4)**	**Strongly Disagree (5)**
29	I intend to check announcements from UUM portal systems frequently					
30	I intend to be a heavy user of UUM portal system					
31	I always have intention to repeating use the every activity regarding UUM					
Suggestion:						

Portal Self Efficacy (ES)		Strongly Agree (1)	Moderately Agree (2)	Slightly Agree (3)	Moderately Disagree (4)	Strongly Disagree (5)
32	I feel confident finding information in the UUM portal system					
33	I have the necessary skills for using UUM portal system					
34	I always thankful of using UUM portal system to accomplish my works					
Suggestion:						